

CLAIMS

1. A chemical source vapor pressure control system (700) comprising a deposition chamber (708), a chemical source holder (722) for holding said chemical source, a chemical source heater (720), a source heater controller (728), and a deposition accumulation sensor (710), said heater controller electrically connected to said deposition accumulation sensor to control the heating of said source; said system characterized by:

said temperature controlled deposition accumulation sensor (710) located out of line-of sight with said chemical source; and

a sensor temperature control unit (712) for controlling the temperature of said accumulation sensor to a temperature lower than the condensation temperature of the chemical source at the desired vapor pressure.

2. A chemical source control system as in claim 1 wherein said deposition chamber has chamber walls (708) and further comprising a chamber wall temperature control system for maintaining said walls at a temperature that is sufficiently high to prevent condensation of said chemical source.

3. The chemical source vapor pressure control system as in claim 1 and further characterized by a pressure gauge (706), a gas control valve (744), and a pressure controller (752) connected between said gauge and said valve to control the total pressure within said deposition chamber to a pressure higher than said controlled vapor pressure of said chemical source.

4. The chemical source vapor pressure control system as in claim 1 and further characterized by a source of an etch gas connected to said gas control valve, and said sensor senses an etching product.

5. The chemical source vapor pressure control system as in claim 4 and characterized in that said chemical source is selected from the group consisting of Hf, Zr, Ru, RuO₂, Si, W, Mo, Co, Cu, Al, Os, OsO₂, Fe, Ta and combinations thereof; and said etching gas is selected from the group consisting of Cl₂, Cl₂/N₂, Cl₂/O₂/O₃, N₂/HF, N₂/ClF₃, CO, CO/N₂ and combinations thereof.

6. The chemical source vapor pressure control system as in claim 1 and further characterized by a pressure controlled reservoir (780); a shutoff valve (744') in series fluidic communication between said pressure controlled reservoir and said deposition chamber to substantially equalize the pressure between said deposition

chamber and said pressure controlled reservoir between successive ALD doses.

7. The chemical source vapor pressure control system as in claim 1 wherein said source is applied for ALD and the capacity of said deposition chamber is 20 times or more larger than the capacity required for a single ALD dose.

5 8. A method for substantially controlling the vapor pressure of a chemical source within a source space said method comprising:

sensing the accumulation of said chemical on a sensing surface; and

controlling the temperature of said chemical source depending on said sensed accumulation.

10 9. A method as in claim 8 wherein said temperature of said chemical source is controlled to maintain a minimal measurable condensation rate on said sensing surface.

15 10. The method of claim 8 and further characterized by controlling the temperature of said sensor to appropriately determine the desired vapor pressure of said chemical.

11. The method of claim 8 and further characterized by controlling the total pressure in said source space to be higher than said vapor pressure of said chemical.

20 12. The method of claim 8 and further characterized by introducing an etching gas into said source space; and etching an elemental or compound target to produce said chemical.